



UATL® PRIVATE RESEARCH  
UNIVERSITY est.2005

Patent: GB2562215

**CALIBRATED NEUTRON FLUX  
SCANNING TECHNOLOGY FOR  
REAL-TIME RECOGNITION OF  
THE COMPOSITION OF  
SUBSTANCES AT THE  
MOLECULAR LEVEL**



# UATL® PRIVATE RESEARCH UNIVERSITY OFFERS LICENSES FOR DEVICE'S DEVELOPMENT AND CREATION BASED ON THE PRESENTED TECHNOLOGY

## APPLICATION SPHERES OF THE DEVELOPED DEVICES



Air



Fuel



Liquid



Blood



Explosives



Detection of any living and dead organisms in real time  
in any environment

# TECHNOLOGY DESCRIPTION

THE TECHNOLOGY IS BASED ON TWO TECHNIQUES  
PRESENTED BELOW

## METHODOLOGY №1: NEUTRON DETECTOR

Application for example - Neutron Detector:  
Integration into the spreader of container  
cranes, scanning containers **in real time**.

Range of action:

The average mean free path of neutrons in air  
is **more than 100 m**.

Purpose of application:

Detection of radioactive materials, such as  
plutonium, **over long distances**.

Feature:

Building materials used in cranes are practically  
transparent to neutrons.

## METHODOLOGY №2: MOLECULAR GAS ANALYZER

Application for example - Blood Sugar  
Sensor:

An accurate, **non-invasive method** for  
controlling blood sugar in diabetes.

Analysis Duration:

On average, it takes **up to 30 seconds**.

Appointment:

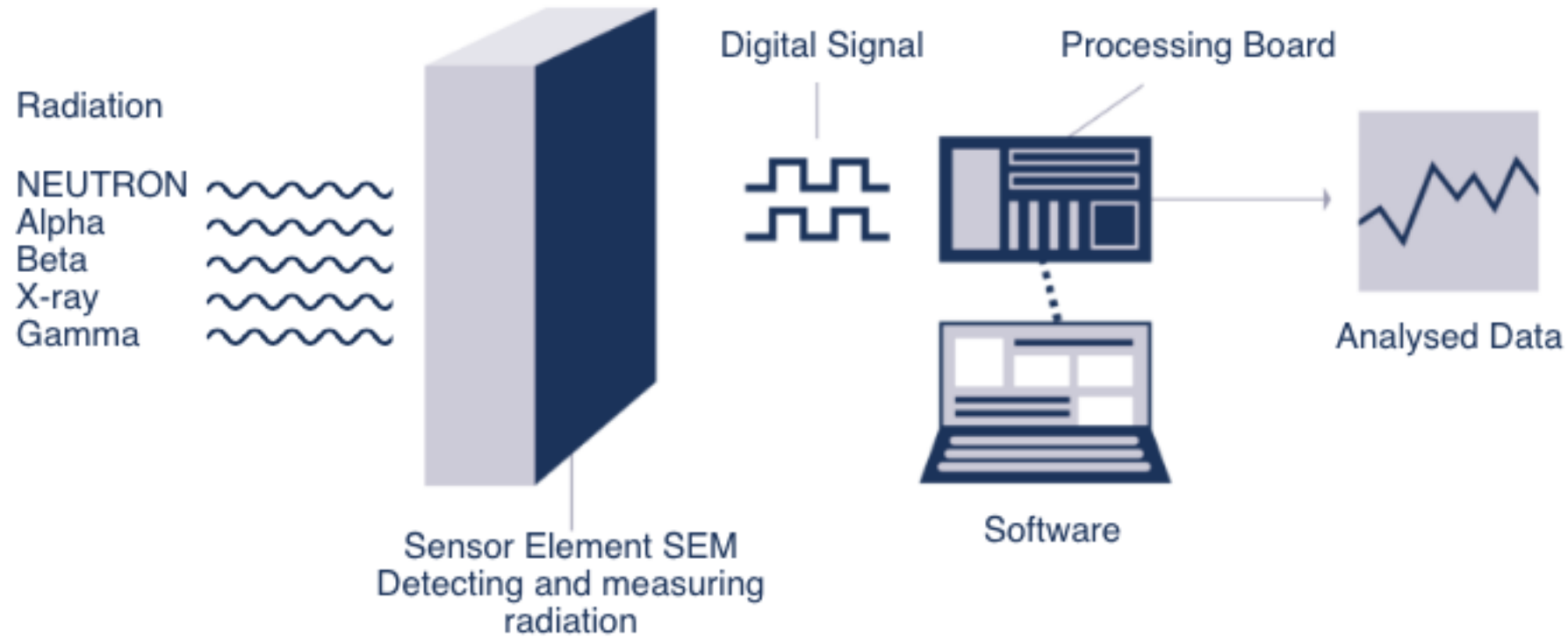
Fast and accurate data acquisition at the  
**molecular level**.

Feature:

For comparison, the classical approach to  
the procedure takes from 30 to 120 minutes.

**The only non-invasive technology.**

# HOW TECHNOLOGY WORKS



## Sensor Element

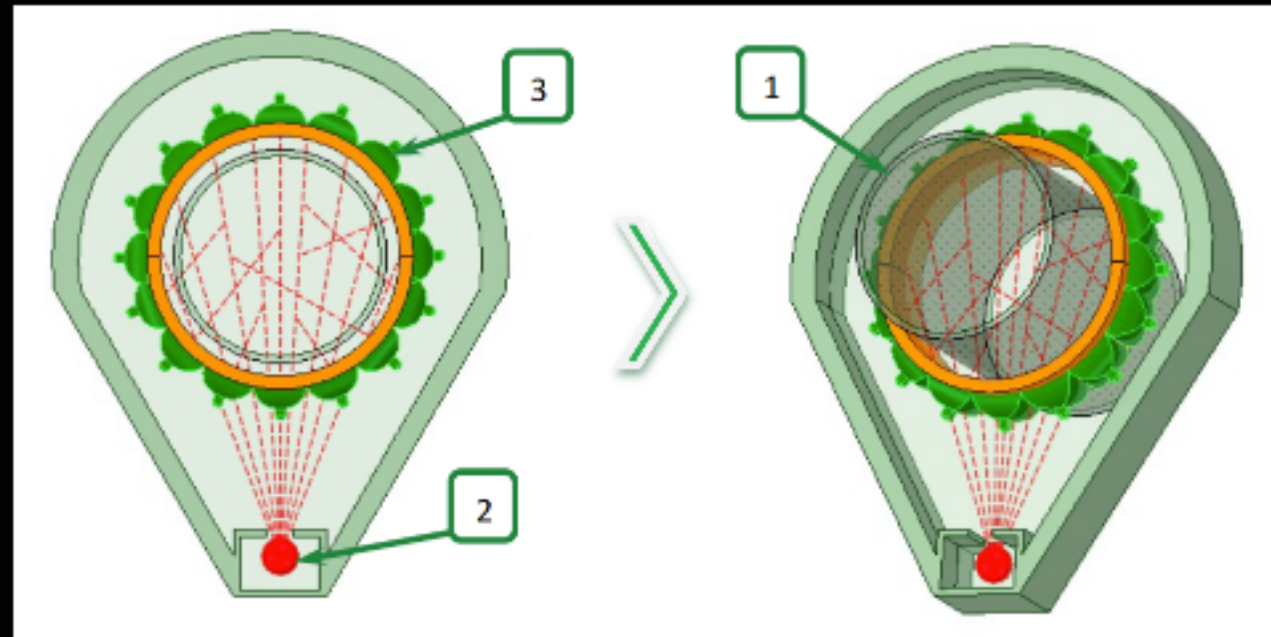
SEM The proprietary sensor element (SEM) is the core the functionality of Sensed by Sensinite® technology. The element is made of special material which due the its properties can be used in challenging environments whilst still maintaining its performance. It is scalable from large to small and it is free of from form constraints.

# SLOW NEUTRONS AS GAS AND LIQUID ANALYZERS

THE DETECTOR EQUIPMENT IS ARRANGED TO **DETECT GAMMA PHOTONS IN ADDITION TO NEUTRONS**, AND THE PROCESSING EQUIPMENT IS CONFIGURED TO COINCIDENCE DATA INDICATIVE OF COINCIDENCE BETWEEN THE DETECTED GAMMA PHOTONS AND THE DETECTED NEUTRONS

1. The advantage of using several detectors is that various detection angles can be exploited giving rise to enhanced detection sensitivity and resolution.
2. By calibrating the system with the known components of the fluid, the molecular composition of the fluid can be analyzed.

SCHEMATIC LAYOUT OF THE METHANE NUMBER MEASUREMENT SYSTEM: (1) NATURAL GAS FLOW, (2) NEUTRON SOURCE, (3) NEUTRON DETECTOR



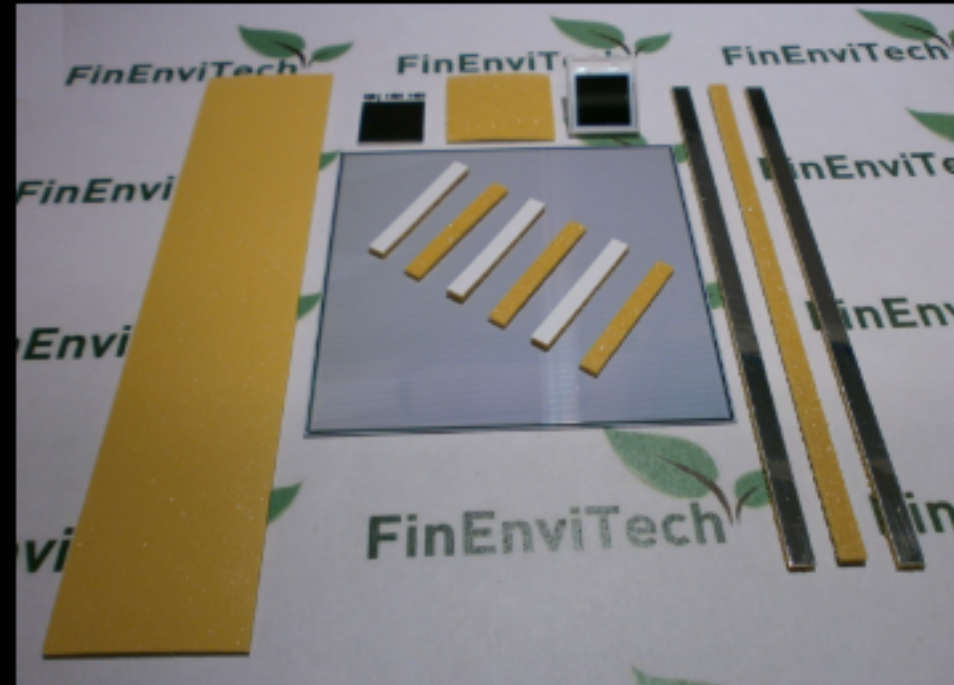
# REAL TIME GAS QUALITY CONTROL SYSTEM

A PROPRIETARY SEM BASED SENSOR SYSTEM FOR SLOW/THERMAL NEUTRON DETECTION, INCLUDING THE SENSORS, SIGNAL PROCESSING AND DATA ACQUISITION ELECTRONICS TOGETHER WITH THE NECESSARY POWER UNITS

## SUPPORTING TECHNOLOGIES:

1. Packaging that fulfills the environmental requirements, such as variations in temperature, humidity, pressure etc.
- 2) Wireless data transmission and integration of this system to IoT.

DIFFERENT TYPES OF SEM ELEMENTS FOR X-RAYS, GAMMA- AND NEUTRON RADIATION DETECTION →

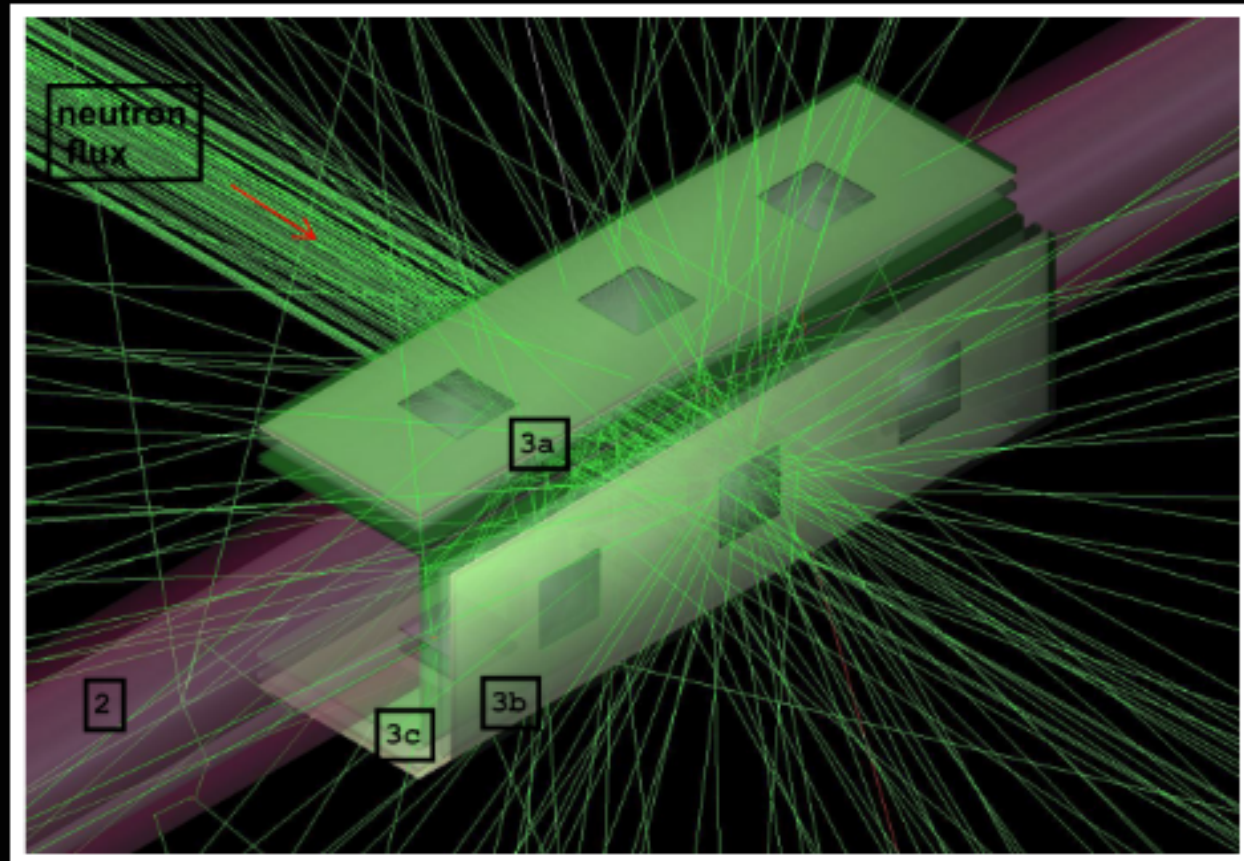


# EXEMPLARY SYSTEM OF THE PRESENT TECHNOLOGY

NEUTRON FLUX GENERATED BY A NEUTRON SOURCE IS ALLOW TO PASS THROUGH FLUID PIPE FOLLOWED BY DETECTION BY **NEUTRON DETECTORS AROUND THE PIPE**

1. The use of plurality of detectors allows the use of maximal number of neutrons for analysis.
2. The sensitivity and resolution can further be enhanced by using plurality of neutron sources along the pipe.

SIMULATED NEUTRONS EMITTED WITHIN A DETECTOR SYSTEM (3A-3C) ARRANGED AROUND THE NATURAL GAS PIPE LINE (2). THE INCIDENT NEUTRONS ARE EMITTED FROM THE UPPER LEFT HAND CORNER



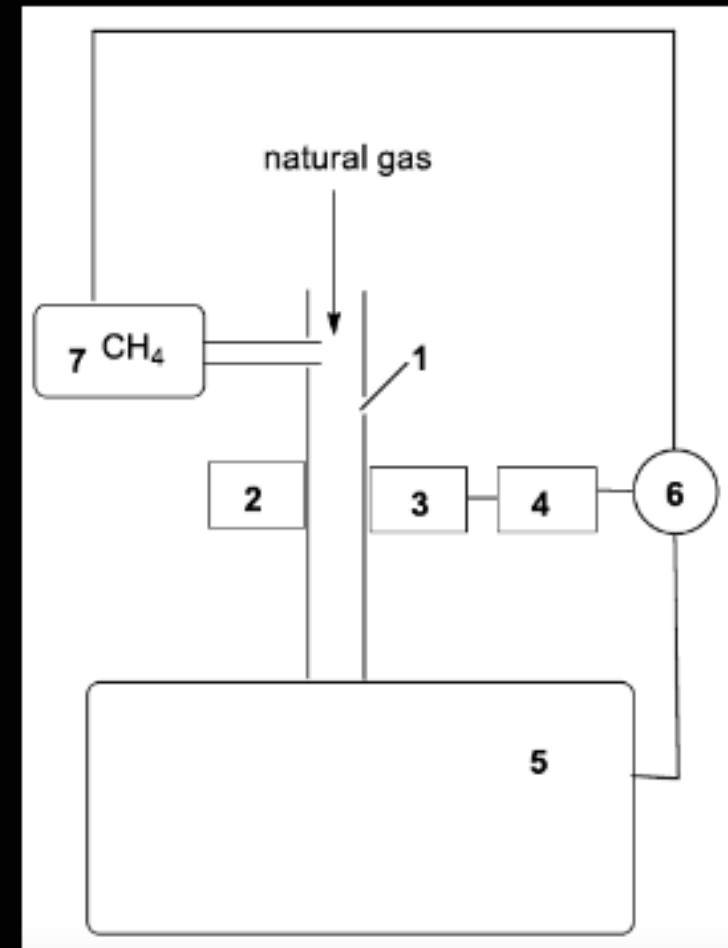
# MEASUREMENT SYSTEM COMPONENTS

BY USING THE PROPOSED SYSTEM, A SPECIFIC SPECTRUM OF NATURAL GAS IN THE PIPE **CAN BE RECORDED**

## COMPONENTS:

1. Gas combustion engine (5);
2. System arranged to analyze gas used as fuel of the gas combustion engine;
3. Controller equipment (6) for controlling operation of the gas combustion engine on the basis of the indicator data indicative of one or more substances of the gas.

SYSTEM CONSIST OF: NATURAL GAS LINE (1), A NEUTRON SOURCE (2), A NEUTRON DETECTOR SYSTEM (3), DATA ACQUISITION AND ANALYSIS SYSTEM (3,4), A TRIGGER UNIT (6) FOR ALLOWING ADDITIVE GAS (E.G. PURE METHANE) TO BE INJECTED FROM A RESERVOIR (5) INTO THE NATURAL GAS INPUT LINE (7)





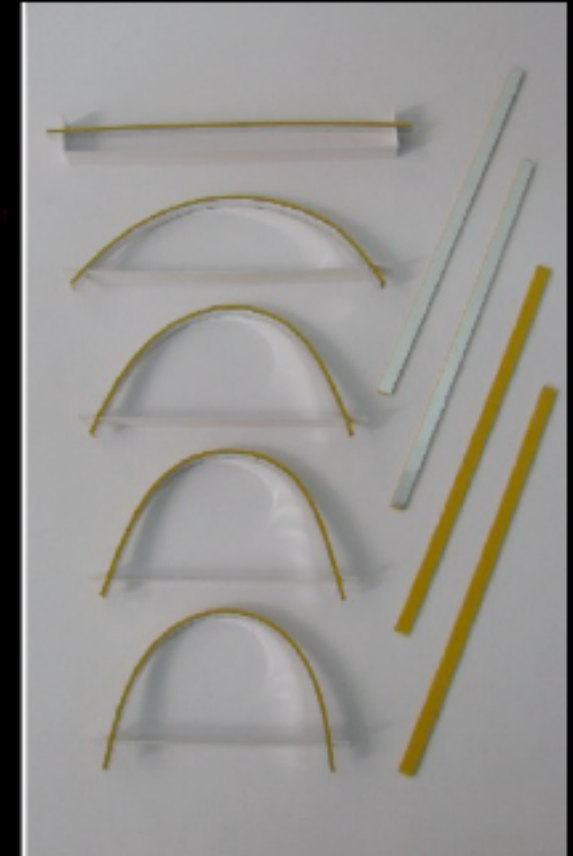
## FLEXIBILITY OF SEM ELEMENTS

THE UNIQUE FLEXIBILITY ALLOWS CREATION OF DETECTION UNIT THAT COMPLETELY REPEATS THE SHAPE OF THE GAS PIPE WHICH LEADS TO ELIMINATION OF INFORMATION LOSSES CAUSED BY GEOMETRICAL ABERRATIONS

### SEM TECHNOLOGY PROVIDES:

1. No limitations on active sensor area or geometries – tailored detector configurations.
2. High homogeneity of scintillation parameters due to the high degree of homogenization of crushed crystal granules achieved by the proprietary manufacturing process.
3. Novel functional materials with wide range of optical and scintillation characteristics achieved by application of new type of multicomponent composite systems.

FLEXIBILITY OF SEM ELEMENTS (GENERAL VIEW - RIGHT PICTURE AND X-RAY VIEW - LEFT PICTURE)



## ADDITIONAL TECHNOLOGY OPTIONS



### MODULE INSTALLATION IN ANY VEHICLES

1. Vehicle verification at a distance.
2. The ability to accurately detect the source, for example, in the parking lot, among other vehicles.



### MONITORING DRONES WITH INTEGRATED MODULE

1. The ability to install a module with a memory device so that it is impossible to intercept device monitoring data.
2. For example, drones can monitor a given area / area, providing real-time data.



### INSTALLATION OF THE MODULE IN ANY PIPES AND VENTILATION DUCTS, CARGO CHECK

1. The cargo may be any parcels, gifts, etc., which must be checked for general security purposes.
2. For example, installation on water pipes to track potential threats of infection or contamination.

# UATL® PRIVATE RESEARCH UNIVERSITY - PATENT AND TECHNOLOGY RIGHTS HOLDER

5 REGISTERED PATENTS  
2 PATENTS PENDING  
6 TECHNOLOGIES IN THE TEST PHASE

UATL® PRIVATE RESEARCH UNIVERSITY IS **FOUNDED**  
**IN 2005**

Production of prototypes and sensors is carried out on the basis of Sensinite Oy.

Works, research and experiments in the field of accelerator physics of elementary particles.



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